

PATENT COOPERATION TREATY

PCT

NOTIFICATION OF ELECTION

(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
 US Department of Commerce
 United States Patent and Trademark
 Office, PCT
 2011 South Clark Place Room
 CP2/5C24
 Arlington, VA 22202
 ETATS-UNIS D'AMERIQUE
 in its capacity as elected Office

Date of mailing (day/month/year) 05 July 2001 (05.07.01)	
International application No. PCT/US00/27198	Applicant's or agent's file reference 03251.00002
International filing date (day/month/year) 03 October 2000 (03.10.00)	Priority date (day/month/year) 05 October 1999 (05.10.99)
Applicant PORTER, Marshall, Ray	

1. The designated Office is hereby notified of its election made:



in the demand filed with the International Preliminary Examining Authority on:

12 February 2001 (12.02.01)



in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was

was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer H. Zhou Telephone No.: (41-22) 338.83.38
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PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

To: ROBERT H. RESIS BANNER & WITCOFF, LTD. TEN SOUTH WACKER DRIVE, SUITE 3000 CHICAGO, IL 60606-7407		<div style="text-align: right; font-size: 1.2em; font-weight: bold;">09 NOV 2001</div>	
Applicant's or agent's file reference 03251.00002		IMPORTANT NOTIFICATION	
International application No. PCT/US00/27198	International filing date (day/month/year) 03 OCTOBER 2000	Priority Date (day/month/year) 05 OCTOBER 1999	
Applicant CONIX CORPORATION			

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.
4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

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NOV 15 2001
03251.00002
BANNER & WITCOFF, LTD.

Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer <div style="text-align: center;"> B. Heitbrink </div> Telephone No. (703) 308-0661
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PATENT COOPERATION TREATY

PCT

REC'D 14 NOV 2001

WIPO PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

4


Applicant's or agent's file reference 03251.00002	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/US00/27198	International filing date (day/month/year) 03 OCTOBER 2000	Priority date (day/month/year) 05 OCTOBER 1999
International Patent Classification (IPC) or national classification and IPC IPC(7): B29C 33/42, 45/37 and US Cl.: 264/69, 328.12; 425/577		
Applicant CONIX CORPORATION		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets.
- ☐ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority. (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of _____ sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of report with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability, citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 12 FEBRUARY 2001	Date of completion of this report 11 OCTOBER 2001
Name and mailing address of the IPEA/US Commissioner of Patents and Trademarks Box PCT Washington, D.C. 20231 Facsimile No. (703) 305-3230	Authorized officer  Jill L. Heitbrink Telephone No. (703) 308-0661



INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/27198

I. Basis of the report

1. With regard to the elements of the international application:*

☒ the international application as originally filed☒ the description:pages 1-8, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of _____☒ the claims:pages 9-10, as originally filedpages NONE, as amended (together with any statement) under Article 19pages NONE, filed with the demandpages NONE, filed with the letter of _____☒ the drawings:pages 1-2, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of _____☒ the sequence listing part of the description:pages NONE, as originally filedpages NONE, filed with the demandpages NONE, filed with the letter of _____2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).☐ the language of publication of the international application (under Rule 48.3(b)).☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:☐ contained in the international application in printed form.☐ filed together with the international application in computer readable form.☐ furnished subsequently to this Authority in written form.☐ furnished subsequently to this Authority in computer readable form.☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.4. ☒ The amendments have resulted in the cancellation of:☒ the description, pages NONE☒ the claims, Nos. NONE☒ the drawings, sheets/fig NONE5. ☐ This report has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

**Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/27198

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. statement

Novelty (N)	Claims	<u>6, 7, 13 and 14</u>	YES
	Claims	<u>1-5 and 8-12</u>	NO
Inventive Step (IS)	Claims	<u>6, 7, 13 and 14</u>	YES
	Claims	<u>1-5 and 8-12</u>	NO
Industrial Applicability (IA)	Claims	<u>1-14</u>	YES
	Claims	<u>none</u>	NO

2. citations and explanations (Rule 70.7)

Claims 1-5 and 8-12 lack novelty under PCT Article 33(3) as being anticipated by ELLWOOD et al. in view of GROLEAU. ELLWOOD et al. discloses the flow fronts fragmenting and then intermix and homogeneously dispersed in the interfacial area to cause a homogeneous knit line geometry and retractable protrusions (Fig. 4) or dam being incorporated into the mold (Fig. 5). GROLEAU (col. 2, lines 50-58) discloses the flow fronts protruding and forming a knit line of greater surface area and interlocking shape. It would have been obvious that the protrusions which fragment and intermix the flow fronts in ELLWOOD et al. produces an interlocking knit line geometry as stated in GROLEAU by the protruding of the flow fronts or fragments into each other.

Claims 1, 2, 8 and 9 lack novelty under PCT Article 33(3) as being anticipated by KIRBY et al. in view of GROLEAU. KIRBY et al. (col. 4, lines 10-21) discloses the changing of the flow direction for the interacting of the flow fronts. GROLEAU (col. 2, lines 50-58) discloses the flow fronts protruding and forming a knit line of greater surface area and interlocking shape. It would have been obvious that the changing flow direction and interaction of the flow fronts in KIRBY et al. produces an interlocking knit line geometry as stated in GROLEAU.

Claims 1, 2, 8 and 9 lack novelty under PCT Article 33(2) as being anticipated by GROLEAU. GROLEAU (col. 2, lines 50-58) discloses the flow fronts protruding and forming a knit line of greater surface area and interlocking shape.

Claims 6, 7, 13 and 14 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a molded paddle that rotates during the molding process to facilitate interaction of the flow fronts of the resin streams, and either retracting the molded paddle from the mold cavity before molding is completed or the molded paddle being retained in the molded article.

----- NEW CITATIONS -----

US 5,766,654 A (GROLEAU) 16 June 1998, see col. 1, lines 50-58.

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.

PCT/US00/27198

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

PATENT COOPERATION TREATY

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RHR
JUN 04 2001

03251.00002

PCT BANNER & WITCOFF, LTD.

Resp due 29 JUL 2001

WRITTEN OPINION

(PCT Rule 66)

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To: ROBERT H. RESIS
BANNER & WITCOFF, LTD.
TEN SOUTH WACKER DRIVE, SUITE 3000
CHICAGO, IL 60606-7407

Date of Mailing
(day/month/year) **29 MAY 2001**

Applicant's or agent's file reference
03251.00002

REPLY DUE
within TWO months
from the above date of mailing

International application No.
PCT/US00/27198

International filing date (day/month/year)
03 OCTOBER 2000

Priority date (day/month/year)
05 OCTOBER 1999

International Patent Classification (IPC) or both national classification and IPC
IPC(7): B29C 33/42, 45/37 and US Cl.: 264/69, 328.12; 425/577

Applicant
CONIX CORPORATION

1. This written opinion is the first (first, etc.) drawn by this International Preliminary Examining Authority.

2. This opinion contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step or industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

3. The applicant is hereby invited to reply to this opinion.

When? See the time limit indicated above. ~~The applicant may, before the expiration of that time limit, request this Authority to grant an extension, see Rule 66.2(d).~~

How? By submitting a written reply, accompanied, where appropriate, by amendments, according to Rule 66.3. For the form and the language of the amendments, see Rules 66.8 and 66.9.

Also For an additional opportunity to submit amendments, see Rule 66.4.
For the examiner's obligation to consider amendments and/or arguments, see Rule 66.4 bis.
For an informal communication with the examiner, see Rule 66.6.

If no reply is filed, the international preliminary examination report will be established on the basis of this opinion.

4. The final date by which the international preliminary examination report must be established according to Rule 69.2 is: **05 FEBRUARY 2002**

Name and mailing address of the IPEA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Authorized officer

JILL L. HEITBRINK

Facsimile No. (703) 305-3230

Telephone No. (703) 308-0661



WRITTEN OPINION

International application No.

PCT/US00/27198

I. Basis of the opinion

1. With regard to the elements of the international application: *

☒ the international application as originally filed

☒ the description:

pages 1-8

pages NONE, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of

☒ the claims:

pages 9-10

pages NONE, as originally filed

pages NONE, as amended (together with any statement) under Article 19

pages NONE, filed with the demand

pages NONE, filed with the letter of

☒ the drawings:

pages 1-2

pages NONE, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of

☒ the sequence listing part of the description:

pages NONE

pages NONE, as originally filed

pages NONE, filed with the demand

pages NONE, filed with the letter of

2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the written opinion was drawn on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☒ The amendments have resulted in the cancellation of:

☒ the description, pages NONE

☒ the claims, Nos. NONE

☒ the drawings, sheets/fig. NONE

5. ☐ This opinion has been drawn as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this opinion as "originally filed".

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**1. statement**

Novelty (N)	Claims <u>6, 7, 13 and 14</u>	YES
	Claims <u>1-5 and 8-12</u>	NO
Inventive Step (IS)	Claims <u>6, 7, 13 and 14</u>	YES
	Claims <u>1-5 and 8-12</u>	NO
Industrial Applicability (IA)	Claims <u>1-14</u>	YES
	Claims <u>none</u>	NO

2. citations and explanations

Claims 1-5 and 8-12 lack novelty under PCT Article 33(2) as being anticipated by ELLWOOD et al. ELLWOOD et al. discloses the flow fronts interacting to cause an interlocking knit line geometry with a transverse flow of the streams and retractable protrusions (Fig. 4) or dam being incorporated into the mold (Fig. 3).

Claims 1, 2, 8 and 9 lack novelty under PCT Article 33(2) as being anticipated by KIRBY et al. KIRBY et al. (col. 4, lines 10-21) discloses the changing of the flow direction for the interacting of the flow fronts.

Claims 6, 7, 13 and 14 meet the criteria set out in PCT Article 33(2)-(4), because the prior art does not teach or fairly suggest a molded paddle that rotates during the molding process to facilitate interaction of the flow fronts of the resin streams, and either retracting the molded paddle from the mold cavity before molding is completed or the molded paddle being retained in the molded article.

----- NEW CITATIONS -----
NONE

WRITTEN OPINION

International application No.

PCT/US00/27198

Supplemental Box

(To be used when the space in any of the preceding boxes is not sufficient)

Continuation of: Boxes I - VIII

Sheet 10

TIME LIMIT:

The time limit set for response to a Written Opinion may not be extended. 37 CFR 1.484(d). Any response received after the expiration of the time limit set in the Written Opinion will not be considered in preparing the International Preliminary Examination Report.

PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION OF RECEIPT OF
RECORD COPY

(PCT Rule 24.2(a))

To:

STOCKLEY, Darleen, J.
Banner & Witcoff, Ltd.
Suite 3000
Ten South Wacker Drive
Chicago, IL 60606-7407
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 10 November 2000 (10.11.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 03251.00002	International application No. PCT/US00/27198

The applicant is hereby notified that the International Bureau has received the record copy of the international application as detailed below.

Name(s) of the applicant(s) and State(s) for which they are applicants:

CONIX CORPORATION (for all designated States except US)
PORTER, Marshall, Ray (for US)

International filing date : 03 October 2000 (03.10.00)
Priority date(s) claimed : 05 October 1999 (05.10.99)
Date of receipt of the record copy
by the International Bureau : 01 November 2000 (01.11.00)
List of designated Offices :

EP : AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE
National : BR, CA, MX, US

ATTENTION

The applicant should carefully check the data appearing in this Notification. In case of any discrepancy between these data and the indications in the international application, the applicant should immediately inform the International Bureau.

In addition, the applicant's attention is drawn to the information contained in the Annex, relating to:

- ☒ time limits for entry into the national phase
☒ confirmation of precautionary designations
☒ requirements regarding priority documents

A copy of this Notification is being sent to the receiving Office and to the International Searching Authority

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DJS

NOV 28 2000

03248.00002

BANNER & WITCOFF, LTD.

By: ngd, rev'd & dock'd

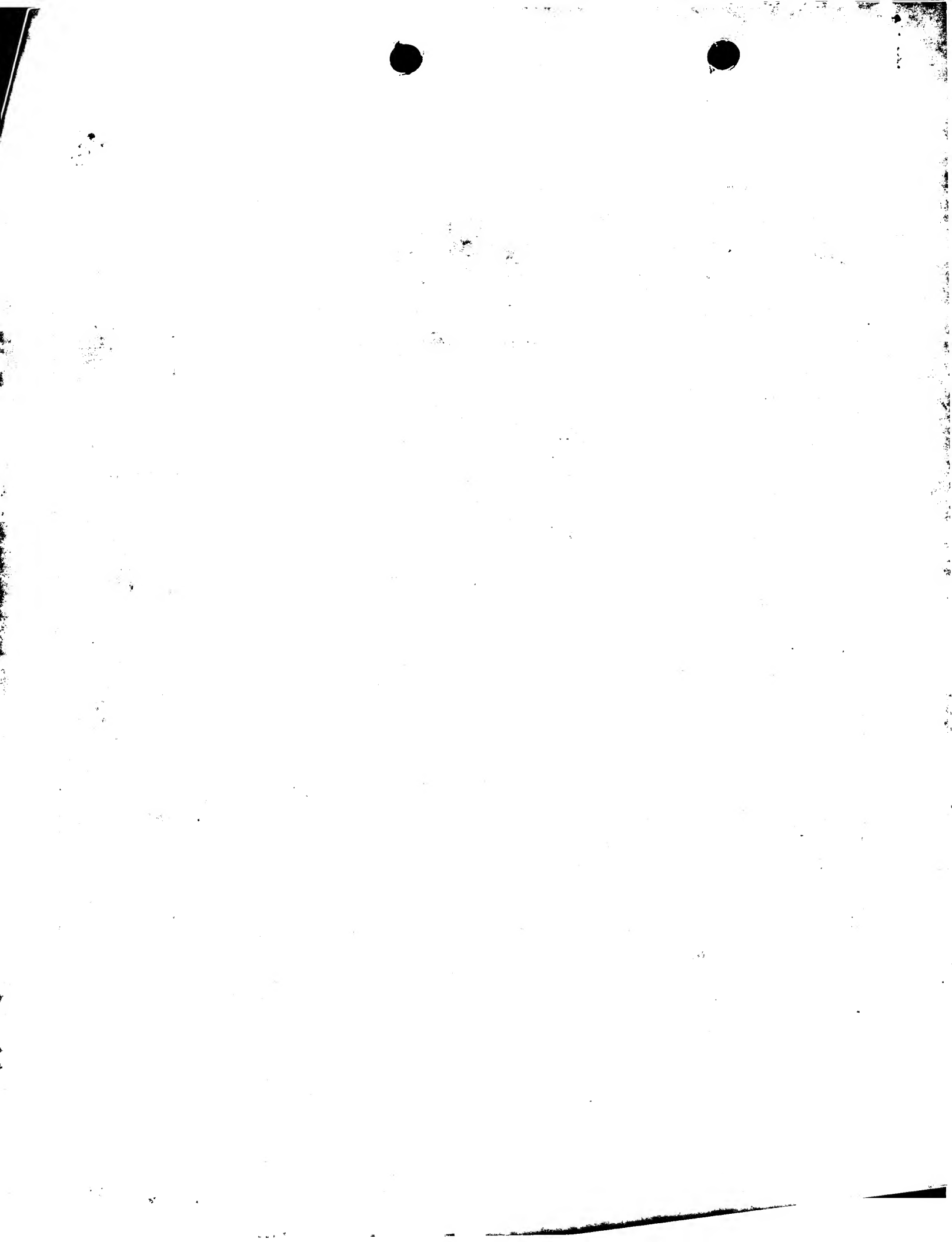
The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer:

L. Homero Hernandez

Telephone No. (41-22) 338.83.38



INFORMATION ON TIME LIMITS FOR ENTERING THE NATIONAL PHASE

The applicant is reminded that the "national phase" must be entered before each of the designated Offices indicated in the Notification of Receipt of Record Copy (Form PCT/IB/301) by paying national fees and furnishing translations, as prescribed by the applicable national laws.

The time limit for performing these procedural acts is **20 MONTHS** from the priority date or, for those designated States which the applicant elects in a demand for international preliminary examination or in a later election, **30 MONTHS** from the priority date, provided that the election is made before the expiration of 19 months from the priority date. Some designated (or elected) Offices have fixed time limits which expire even later than 20 or 30 months from the priority date. In other Offices an extension of time or grace period, in some cases upon payment of an additional fee, is available.

In addition to these procedural acts, the applicant may also have to comply with other special requirements applicable in certain Offices. It is **the applicant's responsibility** to ensure that the necessary steps to enter the national phase are taken in a timely fashion. Most designated Offices do not issue reminders to applicants in connection with the entry into the national phase.

For detailed information about the procedural acts to be performed to enter the national phase before each designated Office, the applicable time limits and possible extensions of time or grace periods, and any other requirements, see the relevant Chapters of Volume II of the PCT Applicant's Guide. Information about the requirements for filing a demand for international preliminary examination is set out in Chapter IX of Volume I of the PCT Applicant's Guide.

GR and ES became bound by PCT Chapter II on 7 September 1996 and 6 September 1997, respectively, and may, therefore, be elected in a demand or a later election filed on or after 7 September 1996 and 6 September 1997, respectively, regardless of the filing date of the international application. (See second paragraph above.)

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

CONFIRMATION OF PRECAUTIONARY DESIGNATIONS

This notification lists only specific designations made under Rule 4.9(a) in the request. It is important to check that these designations are correct. Errors in designations can be corrected where precautionary designations have been made under Rule 4.9(b). The applicant is hereby reminded that any precautionary designations may be confirmed according to Rule 4.9(c) before the expiration of 15 months from the priority date. If it is not confirmed, it will automatically be regarded as withdrawn by the applicant. There will be no reminder and no invitation. Confirmation of a designation consists of the filing of a notice specifying the designated State concerned (with an indication of the kind of protection or treatment desired) and the payment of the designation and confirmation fees. Confirmation must reach the receiving Office within the 15-month time limit.

REQUIREMENTS REGARDING PRIORITY DOCUMENTS

For applicants who have not yet complied with the requirements regarding priority documents, the following is recalled.

Where the priority of an earlier national, regional or international application is claimed, the applicant must submit a copy of the said earlier application, certified by the authority with which it was filed ("the priority document") to the receiving Office (which will transmit it to the International Bureau) or directly to the International Bureau, before the expiration of 16 months from the priority date, provided that any such priority document may still be submitted to the International Bureau before that date of international publication of the international application, in which case that document will be considered to have been received by the International Bureau on the last day of the 16-month time limit (Rule 17.1(a)).

Where the priority document is issued by the receiving Office, the applicant may, instead of submitting the priority document, request the receiving Office to prepare and transmit the priority document to the International Bureau. Such request must be made before the expiration of the 16-month time limit and may be subjected by the receiving Office to the payment of a fee (Rule 17.1(b)).

If the priority document concerned is not submitted to the International Bureau or if the request to the receiving Office to prepare and transmit the priority document has not been made (and the corresponding fee, if any, paid) within the applicable time limit indicated under the preceding paragraphs, any designated State may disregard the priority claim, provided that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity to furnish the priority document within a time limit which is reasonable under the circumstances.

Where several priorities are claimed, the priority date to be considered for the purposes of computing the 16-month time limit is the filing date of the earliest application whose priority is claimed.

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PATENT COOPERATION TREATY

FEB 13 2001
03251.00002
BANNER & WITCOFF, LTD. PCT
nga, dockt

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

From the INTERNATIONAL BUREAU

To:

STOCKLEY, Darleen, J.
Banner & Witcoff, Ltd.
Suite 3000
Ten South Wacker Drive
Chicago, IL 60606-7407
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 06 February 2001 (06.02.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 03251.00002	
International application No. PCT/US00/27198	
International filing date (day/month/year) 03 October 2000 (03.10.00)	
International publication date (day/month/year) Not yet published	Priority date (day/month/year) 05 October 1999 (05.10.99)
Applicant CONIX CORPORATION et al	

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, the attention of the applicant is directed to Rule 17.1(c) which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
05 Octo 1999 (05.10.99)	60/157,733	US	25 Janu 2001 (25.01.01)

The International Bureau of WIPO
34, chemin des Colombettes
1211 G n va 20, Switz rland

Facsimile No. (41-22) 740.14.35

Authorized officer

Beatriz LARGO

Telephone No. (41-22) 338.83.38

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WO 01/2498
PCT/US00/27

PATENT COOPERATION TREATY

03251.00002
APR 26 2001
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BANNER & WITCOFF, LTD.

PCT

NOTICE INFORMING THE APPLICANT OF THE
COMMUNICATION OF THE INTERNATIONAL
APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

STOCKLEY, Darleen, J.
Banner & Witcoff, Ltd.
Suite 3000
Ten South Wacker Drive
Chicago, IL 60606-7407
ETATS-UNIS D'AMERIQUE

Date of mailing (day/month/year) 12 April 2001 (12.04.01)		
Applicant's or agent's file reference 03251.00002		IMPORTANT NOTICE
International application No. PCT/US00/27198	International filing date (day/month/year) 03 October 2000 (03.10.00)	
Applicant CONIX CORPORATION et al		

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
BR,CA,EP,MX

The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).

3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
12 April 2001 (12.04.01) under No. WO 01/24986

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

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If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

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The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Authorized officer J. Zahra
Facsimile No. (41-22) 740.14.35	Telephone No. (41-22) 338.83.38



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Ray [US/US]; 12030 Perry County Line Road, Oakdale, IL
62268 (US).

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(74) Agents: STOCKLEY, Darleen, J. et al.; Banner & Wit-
coff, Ltd., Suite 3000, Ten South Wacker Drive, Chicag ,
IL 60606-7407 (US).

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(71) Applicant (*for all designated States except US*): CONIX
CORPORATION [US/US]; 500 Town Center Drive,
Dearborn, MI 48126 (US).

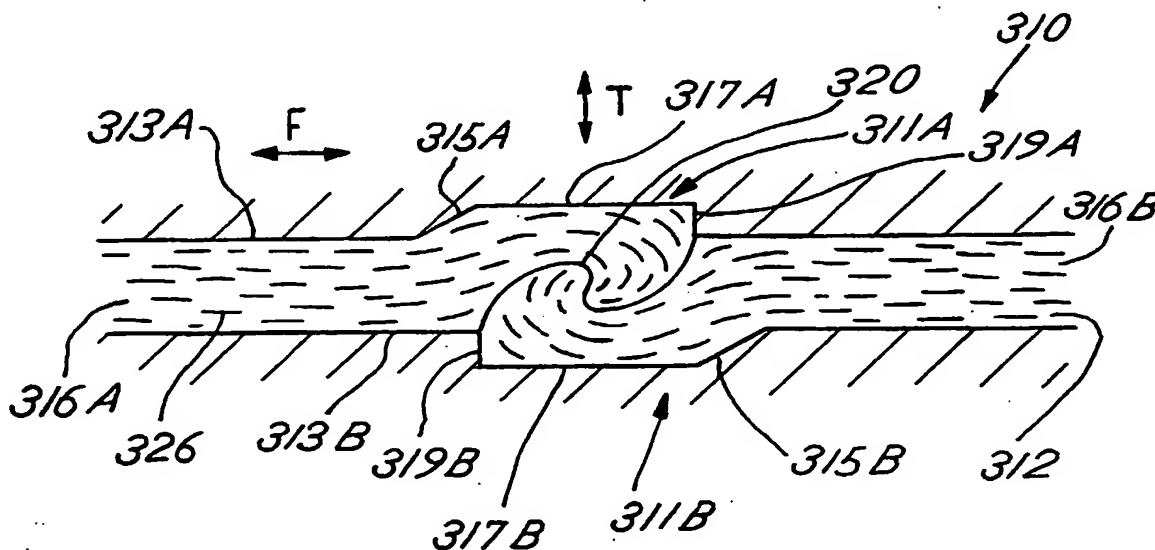
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(72) Inventor; and

(75) Inventor/Applicant (*for US only*): PORTER, Marshall,

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ning of each regular issue of the PCT Gazette.*

(54) Title: INJECTION MOLDING TECHNIQUES UTILIZING INTERLOCKING KNIT LINES



(57) Abstract: The present invention provides a process and apparatus for injection molding articles in which first (316A) and second (316B) resin streams within the mold cavity (312) interact to form an interlocking knit line geometry (320). The process includes the steps of: a) providing a mold defining a mold cavity; (b) providing first and second resin streams within the mold cavity, each resin stream having a flow front; and c) causing the flow fronts to interact to form an interlocking knit line geometry.

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INJECTION MOLDING TECHNIQUES UTILIZING INTERLOCKING KNIT LINES

5 Background of the Invention

The present invention relates to molding processes and apparatus. Specifically, the present invention relates to injection molding processes and apparatus which provide for increased strength of knit lines formed during the molding process.

10 Injection molding typically involves multiple flow fronts within the mold. Flow fronts are the leading interface of a resin stream flowing within the mold. These multiple flow fronts may derive from multiple gates in the mold or from multiple flow paths communicating from a single gate. As the molding process takes place, the flow fronts eventually meet one another,
15 resulting in the formation of one or more knit lines.

In the prior art, knit lines represent areas of decreased strength within the molded article. This is usually undesirable because such areas represent material weakness in the molded article. Such weakness is especially apparent in molded articles that include fiber reinforcement since fiber materials typically do not become oriented or meshed across knit lines. Accordingly, it is a primary objective of the invention to provide molding processes and apparatus for increasing the strength of knit lines formed during injection molding processes.

25 **Summary of the Invention**

A primary aspect of the invention provides for the "handshaking" or intermixing of flow fronts to form interlocking knit lines. Various implements are contemplated to provide for the flow front "handshaking." One method involves modifications in the mold wall geometry to impart rotational or transverse flow to fusing or colliding resin streams. This may result in a "swirling" effect, to provide for the commingling or intermixing of the resin

streams, resulting in an interlocking knit line geometry having increased strength.

The invention also contemplates the use of insert molded or removable implements within the mold cavity to facilitate the flow front "handshaking."

5 For example, an insert molded paddle may be incorporated into the mold at a predetermined and desired location of knit line formation and rotated during the molding process in order to facilitate or improve the handshaking between resin streams. The paddle may be left in the mold cavity to provide increased strength across the knit line. Similarly, directional vanes or directional dams
10 may be insert molded into the mold to provide for flow front handshaking. As an alternative to leaving the paddles, vanes or dams within the molded article, these implements may be temporarily inserted into the mold cavity to induce "handshaking" and then removed before the resin cures. The invention further contemplates modifications to process timing, possibly in conjunction with the
15 above-described insert molded implements, to facilitate the flow front handshake at a predetermined location in the molded article geometry.

In one of its broadest applications, the invention provides an apparatus for injection molding articles, the apparatus comprising a mold cavity for containing an injected volume of resin provided as first and second resin
20 streams, each having a flow front, and means for causing interaction between the flow fronts to form an interlocking knit line geometry. In a particular application, the means for causing interaction between flow fronts may comprise an insert molded implement, such as a paddle, dam or vane. In another particular application, the means for causing interaction between flow
25 fronts may comprise an insert molded implement, such as a paddle, dam or vane, in combination with process timing means for causing the collision of the flow fronts at a predetermined place in the mold.

In another of its broadest applications, the invention also provides a process for injection molding articles, the process comprising the steps of: a)
30 providing a mold defining a mold cavity; b) providing first and second resin

streams within the mold cavity, each resin stream having a flow front; c) causing the flow fronts to interact to form an interlocking knit line geometry.

One advantage provided by the invention is increased strength of molded articles in the local area of the knit line formation. Thus, articles molded according to the invention will typically have greater strength and structural integrity than articles molded according to conventional techniques. Moreover, articles which require increased strength and structural integrity, such as structural polymeric articles may now be formed using injection molding techniques.

The invention also provides increased versatility in mold design with respect to fill gate locations. Prior to the invention, the selection of fill gate locations on a mold depended in a large part on the geometry of the molded article. For example, in the prior art, gate locations were selected such that knit lines were formed in an area of a molded article that is least susceptible to failure under mechanical load. Since the present invention provides increased strength in the area of knit lines, the invention permits the formation of knit lines even in areas where failure may be more likely. Thus, gate locations need not be selected to provide for knit line formation in limited locations within the molded article.

20

Brief Description of the Drawings

The accompanying drawings which are incorporated into and form a part of the specification, illustrate several embodiments of the present invention and, together with the description, serve to explain the principles of the invention. The drawings are only for the purpose of illustrating a preferred embodiment of the invention and are not to be construed as limiting the invention. In the drawings, in which like numbers refer to like parts throughout:

FIGURES 1 and 2 are sectional views of a mold and molding process according to the prior art;

FIGURE 3 is a sectional view of a mold wall geometry and molding process according to a preferred embodiment of the invention;

FIGURE 4 is a sectional view of a mold, insert molded paddle and molding process according to another preferred embodiment of the present invention;

FIGURE 5 is a sectional view of a mold, insert molded vane and molding process according to another preferred embodiment of the present invention; and

FIGURE 6 is a sectional view of a mold, insert molded dam and molding process according to another preferred embodiment of the present invention.

Description of the Preferred Embodiments

Referring to FIGURES 1 and 2, an injection mold and associated molding process of the prior art involve a mold 10, defining a mold cavity 12 for receiving a volume of resin 14 therein. Resin 14 is provided via a first resin stream 16, having a first flow front 18, and a second resin stream 20 having a second flow front 22. As will be apparent to those of ordinary skill, resin streams 16 and 20 originate from one or more mold gates (not shown) which permit the ingress of resin 14 to mold cavity 12 from an external resin source (not shown). As indicated by the arrows (A), the flow fronts 18 and 22 approach one another during the molding process and fuse or collide to form a knit line 24 as shown in FIGURE 2. According to prior art techniques, the knit line is typically of a generally planar shape, as shown. Moreover, fibers 26, which are generally oriented longitudinally within the resin streams, tend to become re-oriented in a transverse direction near the knit line so as not to extend across the knit line, thereby forming a weakened area within the article. The molding process described in this paragraph is well known in the art.

Turning now to the preferred embodiments of the present invention, a mold and associated process for molding according to the invention are illustrated in FIGURE 3. Mold 310 defines a mold cavity 312 for receiving a volume of resin in resin streams 316A and 316B. As shown, a means for causing interaction between the flow fronts to form an interlocking knit line

geometry is provided in the form of recesses 311A and 311B formed in the walls 313A and 313B of the mold 310. In this particular embodiment, recess 311A is formed from a first wall 315A extending at roughly a 135-degree angle to the mold wall 313A, a second wall 317A extending roughly parallel to the mold wall 313A and a third wall 319A extending roughly perpendicular to the mold wall 313A. Recess 311B is formed with similar geometry by walls 315B, 317B and 319B.

Both recesses 311A and 311B operate to redirect at least a portion of the respective resin streams 316A and 316B to flow at least partially adjacent one another. As the resin streams 316A and 316B encounter the third walls 319A and 319B, their flow is redirected in a direction, indicated by arrow (T) that is somewhat transverse to the flow path direction, indicated by arrow (F) within the mold cavity. As a result of this redirection, the resin streams are caused to commingle or "handshake", thereby resulting in the formation of an interlocking knit line 320 when the resin cures. As will be appreciated, the interface between the interlocked portions of the molded article represented by the resin streams is stronger than was provided by molding techniques according to the prior art. For example, the molded article will be capable of withstanding higher tensile forces by virtue of the interlocking nature of the knit line 320. Additionally, the orientation of the fibers 326 is redirected in the area of the knit lines and, although not apparent from the illustration, some fibers may extend across the knit line 320 to increase the article strength locally.

Referring now to FIGURE 4, in accordance with another aspect of the invention, an insert molded paddle 430 is provided within the mold cavity 412. Insert molding of paddle 430 may occur according to known general insert molding techniques. Paddle 430 is provided with a number, in this case three, vanes 432 and is mounted within mold cavity 412 so as to permit rotational movement in the direction of arrow (R) of the paddle 430 with respect to the mold cavity. According to the invention, motive means (not shown) is provide to impart rotational force to the paddle 430 during the molding process. Although paddle 430 is illustrated in combination with the wall geometry

features described with respect to FIGURE 3, it will be recognized that the wall geometry is not necessary to the implementation of the paddle 430 as a means for causing interaction between the flow fronts to form an interlocking knit line 420. As in the embodiment of FIGURE 3, the fibers 426 are re-oriented in the area of the knit line 420. Additionally, it will be apparent that paddle 430 may be retained within the molded article and therefore provides additional reinforcement across knit line 420. Alternatively, paddle 430 may be removed prior to curing of the resin, but after it has been utilized to redirect the resin streams to form the interlocking knit lines or to eliminate the knit line altogether. As will be apparent to those of ordinary skill, paddle 430 may be made of any suitable material. If removed during the molding process, it would need to be of a suitable strength and durability for re-use.

Referring now to FIGURE 5, another preferred embodiment of a molding apparatus and associated method are illustrated. In this case, a pair of insert molded vanes 550A and 550B are provided within mold cavity 512, in combination with the wall geometries described with respect to FIGURE 3. Vanes 550A and 550B operate to redirect or channel the resin streams 516A and 516B. Vanes 550A and 550B may be provided as removable elements that may be retracted from the mold cavity, using suitable mechanical implements, after the resin streams have been redirected. Alternatively, vanes may be retained in the molded article and formed of a material suitable for bonding with the resin and providing increased strength across the knit line 520.

FIGURE 6 illustrates yet another preferred embodiment of a mold and associated method according to the invention. In this embodiment, directional dams 660A and 660B are provided within the mold cavity 612 to induce the desired flow pattern within the resin streams 616A and 616B. As illustrated, in contrast to the geometry provided by recesses 311A and 311B relative to FIGURE 3, the directional dams 616A and 616B extend into the flow path of the resin streams 616A and 616B. Moreover, each dam is provided with a first surface 618A, 618B which redirects one of the resin streams in a transverse direction and a second surface 620A and 620B which redirects the

other resin stream in a transverse direction. Thus, each dam 616A and 616B encounters and influences both of the resin streams.

In all of the aforescribed embodiments, the molding process timing must be appropriate for causing the fusion or collision of the resin streams to occur at the location of the means for causing interaction between the flow fronts to form an interlocking knit line geometry. As will be apparent to those of ordinary skill in the art, process timing would involve the flow rates through the gates of the mold corresponding to the resin streams and may also involve adjustments to the flow path length for each of the resin streams. Alternatively, the geometric modifications or insert molded implements may be adapted to an existing mold in which the location of knit line formation is known.

Those of ordinary skill will appreciate that the above described geometries are merely exemplary and are not the only geometries contemplated by the invention. For example, although generally straight or planar surfaces are illustrated, the invention also contemplates the use of curved or contoured surfaces in order to reduce friction or achieve particular flow characteristics in the area of knit line formation.

Likewise, the aspects of the invention relating to the use of insert molded implements, such as the disclosed paddle, vanes or dams are not limited to such embodiments. Other types of implements may be provided to redirect the resin streams. Moreover, although the invention is described in the context of forming an interlocking knit line, if commingling or interaction between the flow fronts is sufficient, the invention may provide for the elimination of knit lines altogether and is thus not limited to processes where knit lines are present in the finished article.

Although the preferred embodiments of this invention have been described hereinabove in some detail, it should be appreciated that a variety of embodiments will be readily available to persons utilizing the invention for a specific end use. The description of this invention is not intended to be limiting on this invention, but is merely illustrative of the preferred embodiment of this invention. Other products, apparatus and methods which incorporate

modifications or changes to that which has been described herein are equally included within this application. Additional objects, features and advantages of the present invention will become apparent by referring to the above description of the invention in connection with the accompanying drawings.

5 What is claimed is:

CLAIMS

1. A process for molding articles, the process comprising the steps of:
 - 5 a) providing a mold defining a mold cavity;
 - b) providing first and second resin streams within the mold cavity,
 each resin stream having a flow front; and
 - c) causing the flow fronts to interact to form an interlocking knit
 line geometry.
- 10 2. The process of claim 1 wherein the mold cavity is modified to impart at
 least one of: rotational and transverse flow to colliding resin streams.
3. The process of claim 1 wherein causing the flow fronts to interact
 includes inserting at least one implement within the mold cavity to
 facilitate interaction of the flow fronts.
- 15 4. The process of claim 3 wherein the at least one implement is one of: a
 molded paddle, directional vane and a directional dam.
5. The process of claim 4 wherein the at least one implement is
 incorporated into the mold at a predetermined, desired location of knit
 line formation.
- 20 6. The process of claim 4 further including, where the at least one
 implement is the molded paddle, rotating the molded paddle during the
 molding process to facilitate interaction of the flow fronts of the resin
 streams and retracting the molded paddle from the mold cavity before
 molding is completed.
- 25 7. The process of claim 4 further including, where the at least one
 implement is the molded paddle, rotating the molded paddle during the
 molding process to facilitate interaction of the flow fronts of the resin
 streams, retaining the molded paddle in the molded article, and bonding
 the molded paddle with the resin to provide increased strength.
- 30 8. An apparatus for injection molding articles comprising:

a mold cavity for containing an injected volume of resin provided as first and second resin streams, each having a flow front; and

means for causing interaction between the flow fronts of the first and second resin streams to form an interlocking knit line geometry.

5 9. The apparatus of claim 8 wherein means for causing interaction between the flow fronts of the first and second resin streams imparts at least one of: rotational and transverse flow to colliding resin streams.

10. The apparatus of claim 8 wherein the means for causing interaction between the flow fronts is at least one implement inserted within the mold cavity.

11. The apparatus of claim 10 wherein the at least one implement is one of: a molded paddle, directional vane and a directional dam.

12. The apparatus of claim 10 wherein the at least one implement is incorporated into the mold at a predetermined, desired location of knit line formation.

13. The apparatus of claim 11 wherein, where the at least one implement is the molded paddle, the molded paddle is rotated during the molding process to facilitate interaction of the flow fronts of the resin streams and is retracted from the mold cavity before molding is completed.

20 14. The apparatus of claim 11 wherein, where the at least one implement is the molded paddle, the molded paddle is rotated during the molding process to facilitate interaction of the flow fronts of the resin streams, is retained in the molded article and is bonded with the resin to provide increased strength.

25

FIG.1
PRIOR ART

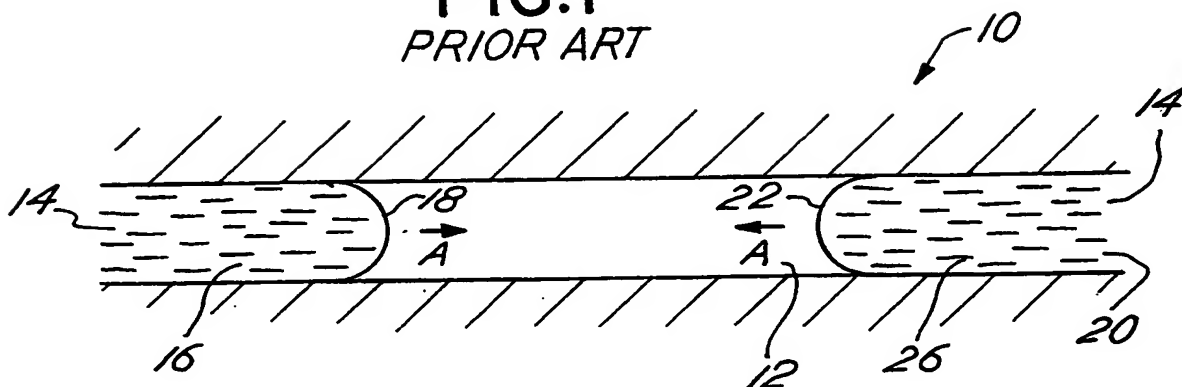


FIG.2
PRIOR ART

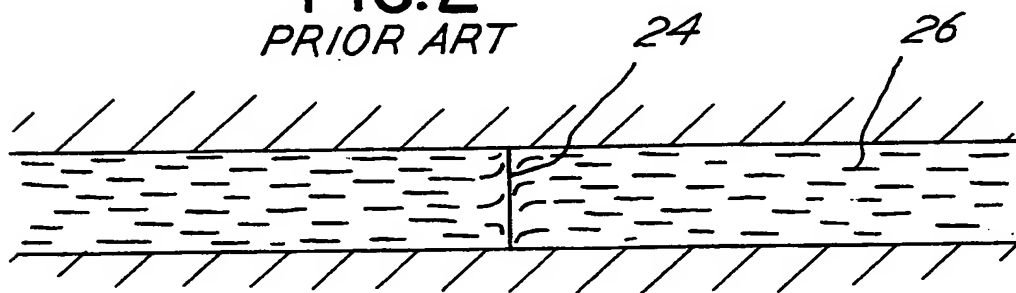
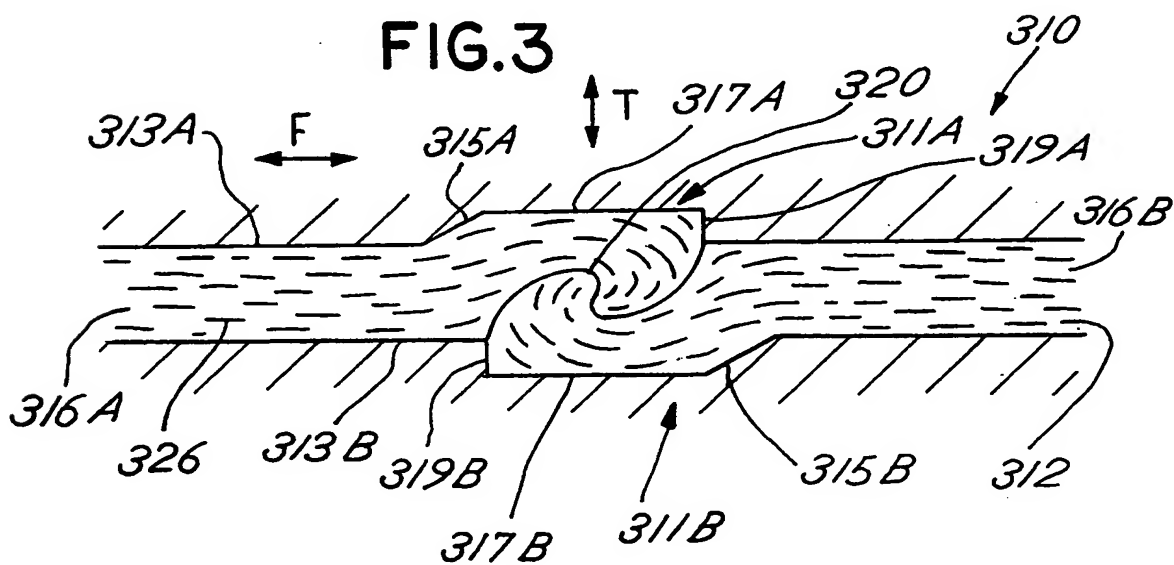


FIG.3



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FIG. 4

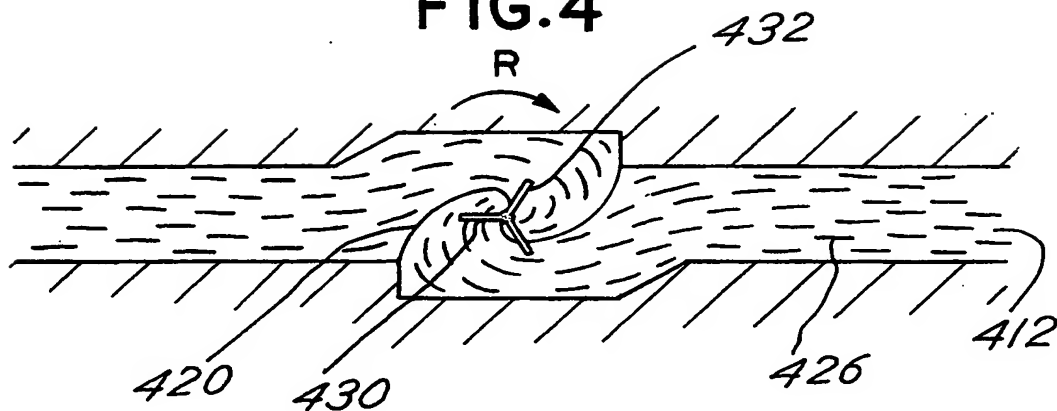


FIG. 5

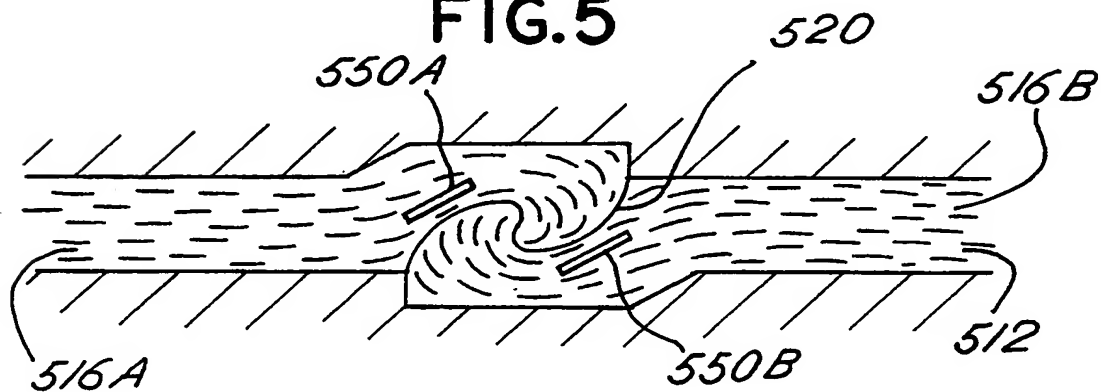
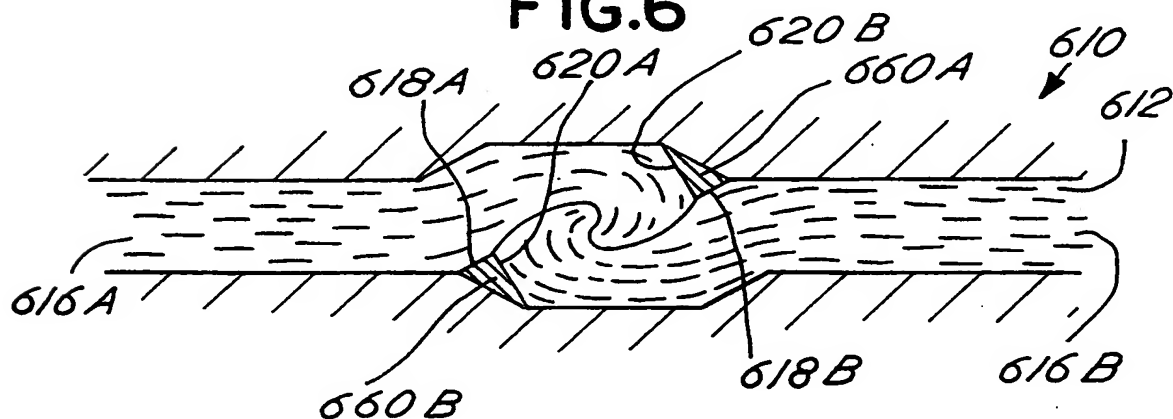


FIG. 6



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INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/27198**A. CLASSIFICATION OF SUBJECT MATTER**

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US CL :264/69, 328.12; 425/577

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Minimum documentation searched (classification system followed by classification symbols)

U.S. : 264/69, 313, 328.7, 328.8, 328.12; 425/425, 429, 573, 577

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim N .
X	US 5,833,913 A (ELLWOOD et al) 10 November 1998, abstract and Figs. 3 and 4.	1-5, 8-12
X	US 4,399,093 A (KIRBY et al) 16 August 1983, col. 4, lines 10-21.	1, 2, 8, 9
A	US 5,690,886 A (KURIHARA) 25 November 1997.	
A	US 5,538,413 (GARDNER et al) 23 July 1996.	
A	US 5,225,136 A (FURUGOHRİ et al) 06 July 1993.	
A	US 4,654,181 A (BRANDENSTEIN et al) 31 March 1987.	

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Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

JILL L. HEITBRINK

Telephone No. (703) 308-0661

INTERNATIONAL SEARCH REPORT

International application No.
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A. CLASSIFICATION OF SUBJECT MATTER

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Name and mailing address of the ISA/US
Commissioner of Patents and Trademarks
Box PCT
Washington, D.C. 20231

Facsimile No. (703) 305-3230

Authorized officer

JILL L. HEIFBRINK

Telephone No. (703) 308-0661

